

The origin of novel coronavirus: COVID-19

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Abstract

The new respiratory disease frequently observed are zoonoses exhibiting positive-stranded RNA viruses called Coronaviruses (CoVs). These groups of the virus are having origin from non-human species such as bats, cows and birds. The transmission of the virus to humans is reported to cause severe acute respiratory infection from cough to pneumonia. The mortality rate is increased from its origin from severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS) to newly developed COVID-19. The following review states that the SARS, MERS to newly developed COVID-19 are generally types of coronavirus. The mode of infection and symptoms exhibited by all the corona types are nearly the same but with the difference in its virulence.

1. Introduction

Emerging new diseases are frequently zoonoses developed from the positive-stranded RNA viruses called Coronaviruses (CoVs) was found associated with common cold symptoms [1]. These viruses mostly infect the upper respiratory system of the mammals including humans. The source of the virus and identification of its reservoirs along with its mode of transmission between the hosts clarifies the difference. Infectious bronchitis virus (IBV) was the first coronavirus to be isolated from domestic fowls in the late 1930s [2]. But, this virus has not been reported to cause any human clinical disease. These avian coronaviruses have been found in nondomestic avian species like peafowl, pheasant, teal, turkey, penguins, pigeon, duck, and Amazon parrot [3]. Further, the coronavirus types causing minor infection in humans are 229E, NL63, OC43, and HKU1 [4]. Rarely these coronaviruses may precipitate pneumonia or bronchitis in the human host. Two species HCoV-229E and subsequently HCoV-OC43 were found to cause severe lower respiratory tract infection in immune-compromised patients and elderly patients (Jean et al., 2013, p. 43). Similarly, in 2004 Holland another novel human coronavirus (HCoV-NL63) was reported from infant (7 months) suffering from respiratory symptoms [5]. This virus also infected other children and the immune-compromised, exhibiting mild upper respiratory symptoms along with rhinorrhoea along with bronchiolitis and croup. A positive novel human coronavirus (HCoV-OC43) respiratory specimens was reported in a pediatric hospital in Montreal (2010). HCoV-OC43 is a member of the species *Betacoronavirus 1* found to infect humans and cattle showing both upper and lower respiratory tract infections along with cold-like symptoms [6]. In 2005, a novel coronavirus HCoV-HKU1, was reported in patients of Hong Kong showing pneumonitis [7]. Thus, Coronavirus is a group of related viruses that cause diseases in mammals and birds.

2. Pandemic eruption by a different novel coronavirus

Coronavirus investigators found that severe acute respiratory syndrome infected infants and old age persons. New advances in the medical sciences of coronaviruses have developed a greater understanding of the trans-species

infection, and pathogenesis of new diseases. The newly emerged zoonotic coronavirus: severe acute respiratory syndrome (SARS-CoV) was declared as a pandemic outbreak (SARS) in 2002–2003 caused by order Nidovirales, *Coronavirus* [8]. Similarly, other coronaviruses have spread from different host species from time to time causing emerging diseases.

The first human cases of SARS were reported to be caused by coronaviruses, from the source of masked palm civets and raccoon dogs which acted as an intermediate source of infection. Many survey studies reported a wide variety of sources of coronaviruses from a bat species in Asian countries. Horseshoe-nosed bats found in different locations of China and Hong Kong were found as a source of SARS-like CoVs in which these bats had found to develop their natural antibodies to tackle these coronaviruses [9]. SARS was the first reported as a pandemic in 2003, where 8,097 cases were found with 774 deaths around 30 countries globally [10].

The incubation period of SARS reported is 2 to 14 days. Few cases showed longer incubation periods for more than 14 days. Symptoms reported are the same as that of regular influenza virus, where the patients first fall ill within 2 days and become eligible to transmit the infection from symptomatic SARS after the fifth day of onset of disease with higher viral load in nasopharyngeal droplets [8].

Middle East respiratory syndrome coronavirus (MERS-CoV) was first reported in 2012. The MERS-CoV is a novel coronavirus that was earlier designated as HCoV-EMC [11]. Similarly, MERS-CoV also found to causes mild to fulminant respiratory tract infection. The clinical manifestation found in the case of MERS-CoV is similar to SARS. Bats are considered as the major suspects in terms of zoonotic infection of both MERS-CoV and SARS. MERS-CoV is a genetically the single-stranded RNA virus belonging to the family Coronaviridae same as that of other coronavirus reported. Monkeys, raccoon dogs, Himalayan palm civets, dogs, cats, and rodents are found susceptible to MERS-CoV [11]. It was stated that this virus transmitted in bats from camels. From camels, it was transmitted to humans, but the reason is unclear.

3. COVID-19 as novel coronavirus

The SARS-CoV-2 also called a COVID-19 epidemic was reported in late December 2019 in Wuhan, China. Earlier, A pneumonia of unknown cause was detected in China was first reported to the WHO Country Office in China on 31 December 2019 [12]. The outbreak was declared a Public Health Emergency of International Concern on 30 January 2020. People who become infected developed serious illnesses mostly difficulty in breathing. Older people, and those with underlying medical problems like high blood pressure, heart problems or diabetes, are reported likely to develop serious illness. Studies to date suggest that the virus that causes COVID-19 is mainly transmitted through contact with respiratory droplets rather than through the air. It was found that molecular divergence is less between SARS-CoV-2 and COVID-19. The scientist found about 4% variability in genomic nucleotides of bat SARS and a bat SARS-CoV-2.

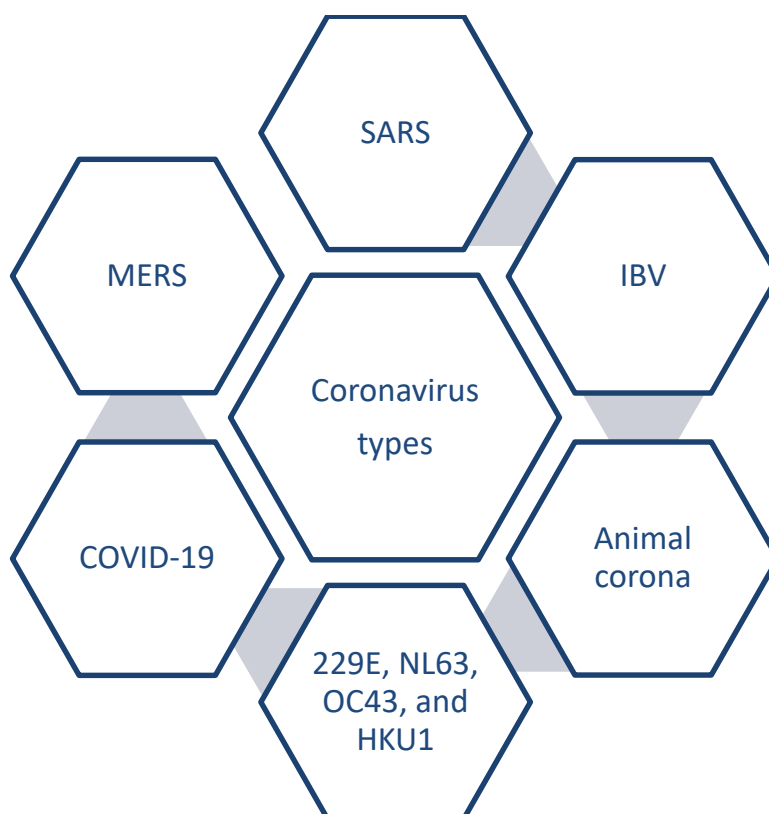


Fig.1. Types of coronavirus

4. Pathogenesis found in all above-mentioned coronavirus shows

Several distinct features such as pneumonia with epithelial cell proliferation are reported in patients infected by a coronavirus. Few reported macrophage infiltrations of the lungs along with the haemophagocytosis [13].

Symptoms	SARS	MERS	COVID-19	IBV (in the avian group, not in human)	229E, NL63, OC43, and HKU1
Fever	**	**	***	**	**
Dry cough	*	*	***	-	*
Runny nose	***	***	*	-	***
pneumonia	**	**	***	Extra-pulmonary damage	**
Shortness of breath	**	**	***	**	**

Chills and muscle aches,	**	**	***	**	**
Headache	**	**	**	-	**
Diarrhea	*	**	***	-	**
sore throat	***	**	***	-	**
rash	***	***	*	-	***
Other specific					Tachypnea (34 respirations/minute), dyspnea, and hypoxemia

*- minor symptoms, **- mostly observed symptoms, ***- majorly observed symptoms, - data not available.

Many research is going on to check that use of probiotics or nutraceuticals can prevent the infection by antioxidant mechanism along with existing drugs available in the market [14–21].

5. Mode of transmission

The interaction of the coronavirus antigenic spike protein is complementary with the host cell receptor exhibiting tissue tropism and infectivity [22]. The transmission primary mode of COVID-19 is via respiratory droplets from an infected person. This generally spreads from coughs, sneezes, or talks. The fomite borne transmission is by settling of the droplets of an infected person on the nose, eyes or mouth of a healthy individual. Coronaviruses remain for several days on surfaces of metal, glass, or plastic for several days. The transmission also spread by touching the face with hands contaminated by fomite mode. Respiratory droplets settle due to heaviness as compared to air, hence, a distance of more than six feet prevent the spread of infection from the suspected person

The basic transmission of infection is mostly by the droplet mode while it is unclear if airborne transmission occurs with COVID-19 infection. It is thus suggested the application of protective measures, including N95 masks. In general, the Coronavirus spread can be prevented by [2,4]:

- Covering the mouth during coughing and sneezing to avoid the droplets containing the virus to spread in the air
- Isolating the infected person who's already carrying the virus from healthy individuals
- Avoiding any contact with the object which contains the virus and then touching your nose or mouth

6. Conclusion

Coronavirus has affected the globe from time to time since the 20th Century by its different forms. The COVID-19 is one of the types of Coronavirus that developed pandemic infection such as SARS, MERS, etc. The word corona should be confused with the only COVID-19, but it is one type of acute respiratory infection such as SARS, MERS, etc. The symptoms observed in the case of all Corona subtypes are more or less similar. Thus Corona can briefly be called to all subtypes such as SARS, MERS and the newly evolved COVID-19.

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